



M110/M800

Installation Manual

Thank you for choosing Mission Communications for your monitoring needs!

As part of Mission's commitment to provide you with the highest quality "out of the box" SCADA solutions available, this product and packaging have been thoroughly tested before leaving our manufacturing facility.

The first chapters of this guide focus on pre-Installation and are intended to identify issues and recommend solutions to optimize your installation. Please consider the steps in this guide and confirm that you have received all the necessary parts for a successful installation. Verify that your RTU is fully functional and that there are no site related connectivity issues to overcome. Following these instructions will save you time and effort.

Mission hosts weekly webinars and emails quarterly newsletters. We encourage you and your staff to take advantage of these resources. Five minute training tutorials are also available. Visit www.123mc.com to access these training resources.

Our technical support staff is available at (877) 993-1911 option 2 for further assistance.

Thank you,

The Mission Team

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Chapter 1: Parts and Tools

M110/M800 at a Glance



Enclosures

NEMA 1 - indoor mounting

NEMA 4 - outdoor mounting

Flatpak - control panel or cabinet mounting

What's In The Box:

- Installation manual and setup forms
- RTU in enclosure (NEMA 1, NEMA 4 or Flatpak)
- Battery - 12 V, 5 Ah
- Flying Lead Transformer (120 VAC to 12 VAC, 1.2 amp)
- Pole Mount Antenna Kit (11' RG58 cable with SMA-M connector, pole or wall mount bracket, dual band antenna whip, and (2) pole clamps)
- Accessory Bag (1K ohm resistors, end-of-line resistors, wire nuts and screws)

A package of electronic keys are supplied for new customers. If there are any missing parts, contact Mission Communications.

Recommended Parts and Tools

- Voltmeter or multimeter
- 18/22 gauge wire, 2, 4 or 8 conductor stranded and shielded
- Small flathead screwdriver
- Drill
- Hack Saw
- General hand tools (Wire cutters/strippers, pliers, nut drivers, etc.)
- $\frac{3}{4}$ " Flex conduit with straight and elbow fittings
- Ladder for antenna mounting if necessary
- Unit strut rail and hardware for mounting
- Interposing relays and bases (if no dry contact are available)
- 12 VDC coil interposing relay (if output relays will be used)

Chapter 2: Site Survey and Connectivity Test

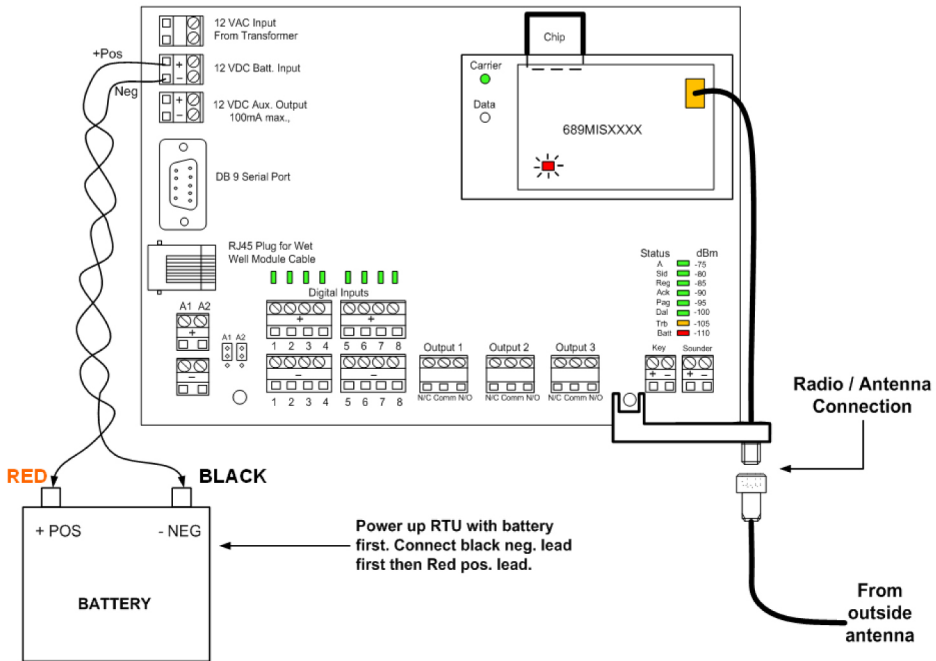
By powering the RTU and testing connectivity before mounting the hardware, you can optimize the signal strength for years of trouble free communications. The test only takes a few minutes since the included battery can provide temporary power.

1. Remove the RTU from the box and place it on or near the control panel it will be monitoring.
2. Remove the antenna cable and antenna whip from the package and hand tighten the SMA-M connector into the RTU's radio SMA-F connection. See Figure 1. DO NOT OVER TIGHTEN.
3. Screw the whip antenna onto its base and then temporarily get it as high as possible outdoors. DO NOT SET IT ON THE GROUND.
4. Power the RTU with the 12 VDC battery (see Figure 1). Connect the negative (black) lead to the battery first and then connect the positive (red) lead. You should then see the vertical status LEDs on the lower right corner of the main board light up in an up and down pattern and then the horizontal digital LEDs above the digital inputs will scroll side to side, then all go out. (See Figure 1 for LEDs).
5. Next, you should see a single solid green LED light up on the top of the vertical status LED stack on the lower right corner of the main board and the radio status red LED on the lower left corner of the radio light up solid. As the green LED on the vertical stack descends downward, the radio status red LED should start blinking. Once the LED on the vertical stack reaches the bottom BAT LED, the green carrier LED should come on and you should hear 3 beeps from the buzzer. This indicates the unit has connected and is online.

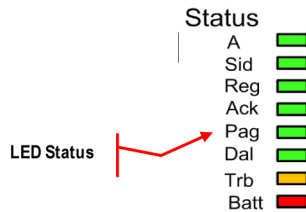
When the RTU is online the green carrier LED will remain on and the red radio status LED will continuously flash. The Top "A" LED on the vertical status LED indicator should be on after the unit transmits its first transmission and the "DAL" LED should be flashing rapidly. The "TRB" LED will be on due to no AC connection to the main board.

If the sequence of events does not occur after two attempts, refer to Chapter 8: Troubleshooting or call technical support.

Main Printed Circuit Board Wired for Site Survey Figure 1



Vertical LEDs (main board)



Chapter 3: RTU Installation and Wiring Overview

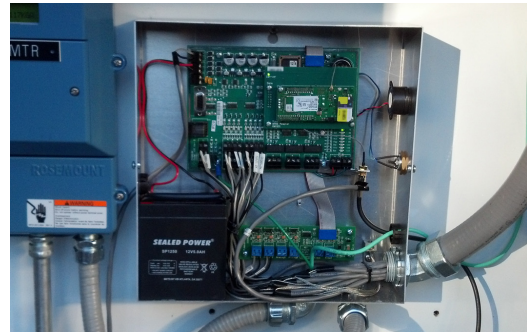
Turn off station power when running wires to the RTU.

Locate the RTU as close as possible to the control cabinet while taking into consideration the antenna cable length. Flatpaks mount inside of the control cabinets. The NEMA 1 enclosures mount on internal walls of buildings. NEMA 4 enclosures mount outdoor on a strut rail.

1. Cut the conduit and wiring holes. Drill and pull the conduit holes in the control cabinet and Mission RTU (NEMA 4 or NEMA 1). Flatpaks have 2 large holes in the back plate to drill through the cabinet inner door and provide wire access. If you have a Flatpak enclosure, mount the antenna on top of the control cabinet or other structure nearby. You can also mount a pole if necessary. Use sealant if desired around the outer edge if on top of the control panel.



Nema 4 mounted on strut rails



Nema 1 mounted on a wall

2. Pull the wires and cables. Verify that station power is off. Before final connection of flex conduit, first pull the wet well cable (if used), then the AC and input wires. Lay wires in wire trays with excess near terminations. Replace wire race covers. Ensure loose wires are NOT touching any other equipment.



Nema 4



Flatpak

CAUTION: To avoid analog spikes, place an MOV suppressor directly across the contactor coils for all of your high load devices. Next, make sure all cables used for digital and analog inputs are shielded, twisted pair wire with the shield connected to ground on the Mission side of the cable and NOT connected on the far end of the cable (to prevent ground loop current). Finally, avoid running the Mission analog and digital cable in the same conduit with 120 VAC cables, especially high current cable. Make sure to dress the Mission signal cables so they do not run parallel to AC or high current cabling.



3. Connect digital inputs. Verify that power is still off. Mission's default input connections are as follows: Inputs 1, 2, and 3 are pump runtime accumulators; Input 4 is high wet well, Inputs 5 and 6 are pump 1 fail and pump 2 fail, Input 7 is phase fail and 8 is unassigned. Refer to the wiring diagram on the M110/M800 cover/door and RTU Installation Form in the packing box. Record input names on the setup form and the diagram. The inputs are normally open by default. You may use normally closed contacts on inputs 4 through 8. However, you must tell Mission Technical Support on the unit set up form or via the telephone. You **MUST** use normally open contacts on pump runtime inputs. Refer to the typical wiring for monitoring a standard trouble relay insert in the back of this manual.



CAUTION: Digital inputs are dry contacts. This means that wires running to these inputs must not have any voltage supplied. This is the number one installation mistake. Do not use a common input wire.

Wire supervision: The main board inputs require the use of a 1000 ohm end-of-line resistor for each digital input used for alarm/event reporting. These resistors are connected to and placed in parallel with the monitored relay contacts and allow the main board circuitry to monitor the integrity of the connections. See Figure 2 for installation. If you cannot easily install the resistors at the relay, you can install them across the digital input you are using for that alarm. By doing that, you will not have line supervision.

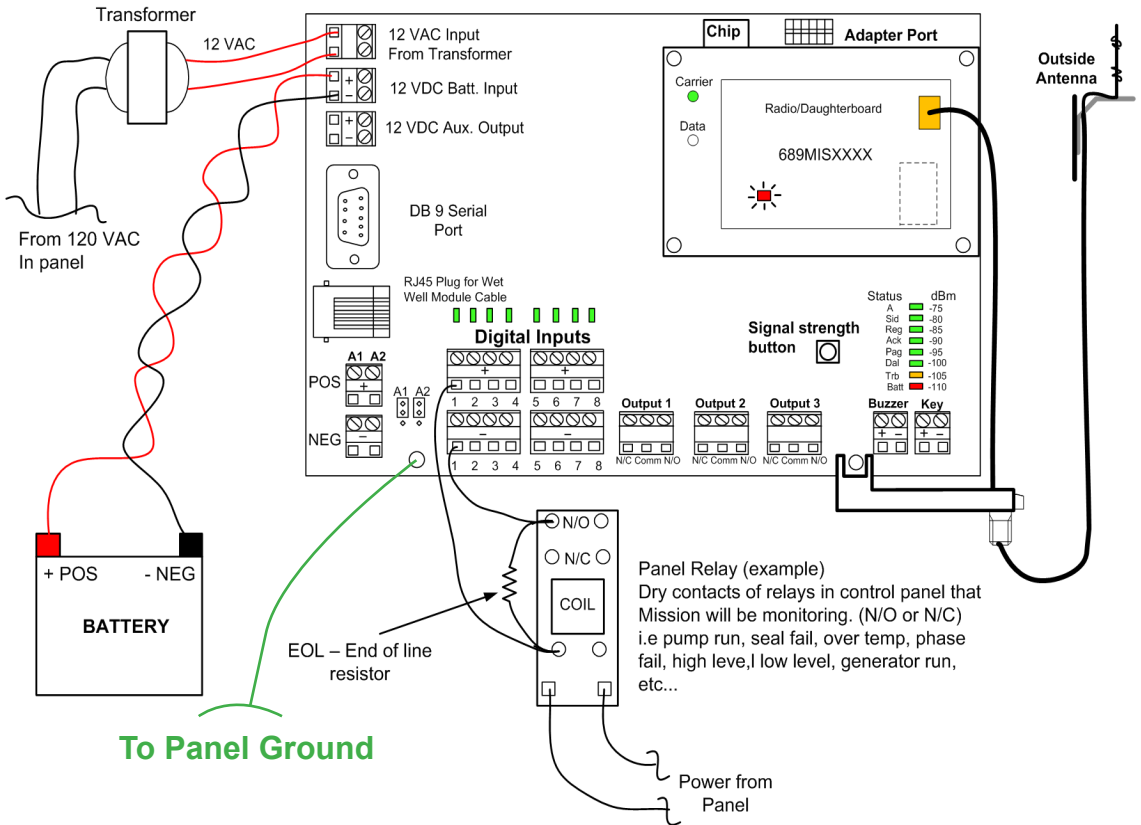
Pump Runtime Inputs: Inputs 1, 2 and 3 are pre-programmed at our facility for pump runtime inputs. If you only use inputs 1 and 2 or you are monitoring just alarms, inputs 1, 2 and 3 can be set to alarm inputs. Call Mission for

assistance. For M110 RTUs: If you are only using inputs 1 and 2 for pump runtimes and you are NOT using input 3 for anything, you can leave the resistor out of input 3 (only this input) and this will then allow you to get simultaneous runtimes of pumps 1 and 2. The data will populate under runtime data on the customer website. Otherwise, install the resistor in the unused input.

Pump runtime inputs should be wired to the normally open contacts of the runtime relays. Alarm relays can be wired either normally open or normally closed. (If ordered and using a Wet Well Module, follow its runtime connection instructions).

4. Ground the RTU. Use 8-10 gauge green wire installed to the Mission back plate screw of the RTU or 1 of the 4 screws holding the main board on to the back plate (refer to Figure 2). Do the same with a NEMA 1 enclosure. The Flatpak will be grounded by the installation onto the panel.

RTU Installation with End-of-Line Resistors



Chapter 4: Antenna Installation

Overview

The antenna should be mounted outdoors and as high up as possible, but able to reach the Mission RTU radio connection with no abrupt routing of the coax. Make sure the antenna is not obstructed by buildings, metal or trees. If attaching to the side of a building, try to place it as high up on the roof line as possible. If the Mission RTU is indoors mount the antenna outside. Integral or attack resistant antennas are available by special order.



The Universal Antenna Mount consists of three main parts – the curved “L” bracket, the antenna whip and the coaxial cable.

1. Install the Mounting Bracket. Before mounting the bracket, verify that the antenna cable will reach the intended mounting area from the RTU. The Universal Antenna Mount can be attached in a variety of ways. It can be mounted directly on the face of a flat surface, mounted to a conduit, or even to a tower leg using the included pipe clamps.



2. Install the antenna cable and antenna whip. After installing the main bracket, connect the SMA-M cable connector to the SMA-F connector on the main board (hand tight and 1/4” turn with a wrench). Then, unscrew the bolt from the molded antenna base. Feed the molded antenna base through the square cutout on the bracket. Place the molded antenna base in the circle cutout. Secure the molded antenna base to the bracket with the bolt. Ensure that the weight of the cable does not damage the antenna base. There should be enough slack in the cable so as it does not rest or touch the top surface of the mounting bracket.

Proper Antenna Installation is Vital

The most common cause of poor RTU performance can be attributed to a poor antenna installation. With the new cellular radio transceivers, antenna installation



becomes even more important. For best operation of the Mission RTU, the antenna should be mounted outside any site structures.

Antenna Installation Tips

DO mount the antenna as high as possible, preferably above the roof.

DO mount the antenna above all metal surfaces close to the installation.

DO run an 8 to 10 gauge ground wire to the Mission RTU enclosure

(back plate for NEMA 4) to ensure that the antenna base and RTU have the same ground potential.

DO wrap excess coax in loose circles of 8-12 inches in diameter. Pinching or tight bends in the coax can restrict the radio signal path in much the same way water flow is restricted through a tight bend in a pipe.

DO NOT mount the antenna inside a metal control cabinet. Although fiberglass cabinets may only attenuate the signal a small amount, Mission always recommends the antenna be mounted outside and above all surfaces.

DO NOT mount the antenna on the side of a metal cabinet. Metal surfaces will reflect the radio signal, preventing it from traveling in all directions.

DO NOT mount the antenna underground, in a dry well, or inside a “canned” lift station.

DO NOT mount the antenna horizontally (sideways) or bend the antenna whip.

DO NOT cut, lengthen, or shorten the coaxial cable. Mission can supply antenna extension cables and connectors up to 50 feet. For lengths above this limit, another RTU mounting location should be made.

Chapter 5: RTU Startup

1. Power the Mission RTU with the 12 VDC battery only. Do not power the station yet. Black lead first, then red (12 VDC). Watch the LEDs to make sure it powers up as previously described. You should then see the vertical status LEDs on the lower right corner of the main board light up in a up and down pattern and then the horizontal digital LEDs above the digital inputs will scroll side to side, then all go out. (See figure 2 for LEDs). Allow the unit adequate time to perform its power-up sequence and synchronization to the network. Five to ten minutes is generally adequate for the process to successfully conclude.
2. Next you should see a single solid green LED light up on the vertical status LED stack on the lower right corner of the main board and the radio status red LED on the lower left corner of the radio light up solid.
3. As the green LED on the vertical stack descends the radio status red LED should start blinking. Once the LED on the vertical stack reaches the bottom “BAT” LED, the green carrier LED should come on and you should hear 3 beeps from the buzzer. This indicates the unit has connected and is online.

NOTE: When the RTU is online the green carrier LED will remain on and the red radio status LED will continuously flash. The top “A” LED on the vertical status LED indicator should be on after the unit transmits its first transmission and the “DAL” LED should be flashing rapidly. The “TRB” LED will be on due to no AC to the main board yet. Once the AC is turned on the “TRB” LED will go out.

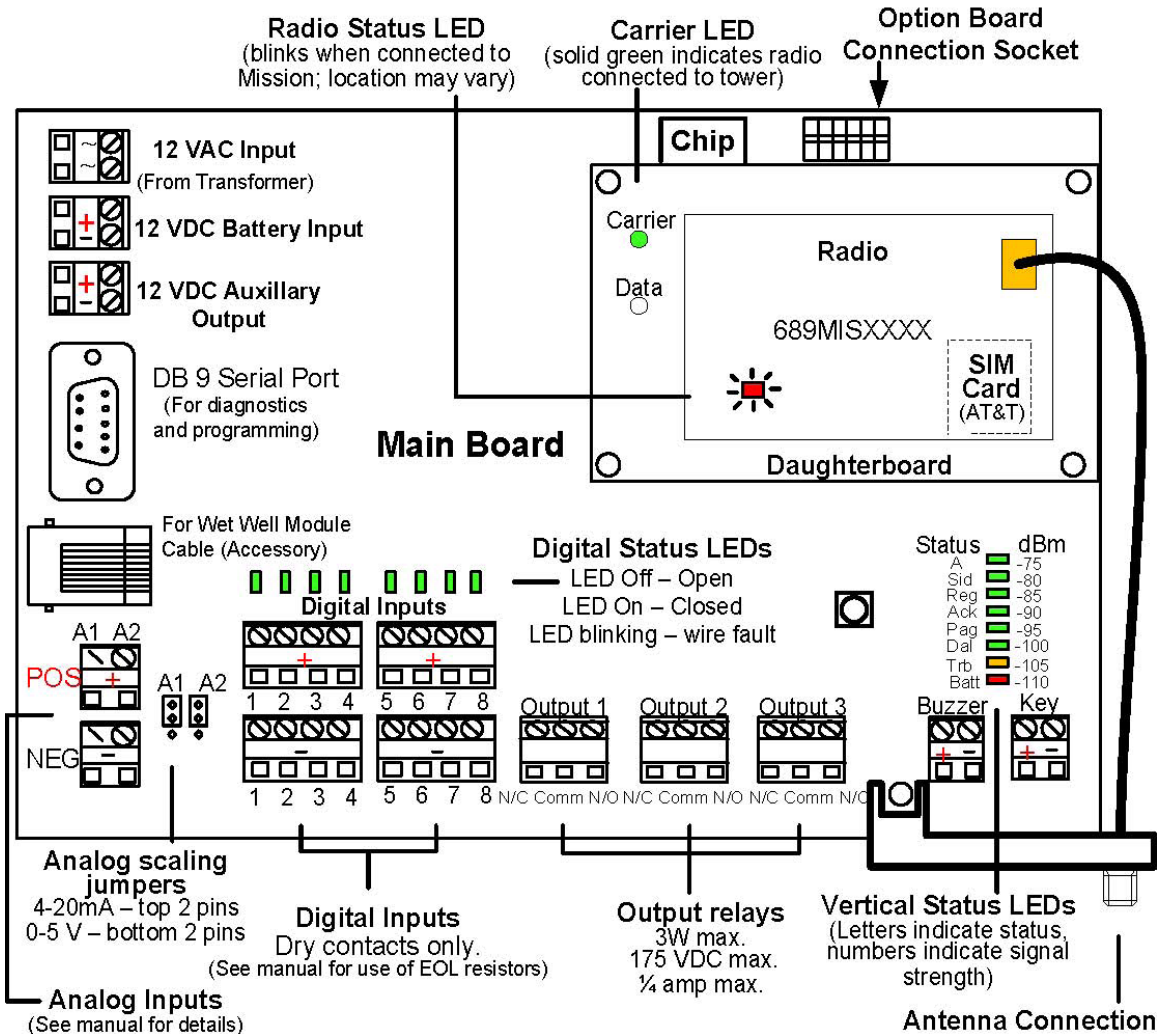
4. Wire the AC power. The Mission RTU is powered by a 12 VAC transformer with flying leads that has a primary input. The primary input (black wires) can handle 120 VAC and the secondary output (red or yellow wires) outputs 12 -16 VAC.



CAUTION: It is very important to ONLY provide 12-16 VAC to the Mission main board AC input. If 120 VAC is applied to the main board, it will cause permanent damage. The transformer should NOT be mounted in the Mission RTU enclosure. Mount the transformer in the control panel.

- Check the wiring connections before powering the pump station. If all wiring is good, power the pump station and immediately focus on the Mission main board. Check to ensure the Mission RTU is still operating. If somehow a wiring mistake has been made and 120 VAC is being fed to the Mission RTU main board, it will be evident. If there appears to be a mistake, immediately remove power before it permanently damages the Mission RTU unit. If power is OK, proceed to testing the RTU.

Main Board Connections



Chapter 6: Test the Installation

It is HIGHLY RECOMMENDED that the following tests be done to ensure the customer or end user gets proper notifications.

1. Test AC power. Check the yellow “TRB” LED. It should not be illuminated. If it is, the Mission RTU is not wired properly for 12 VAC. If the yellow LED is blinking then one of the alarm inputs (4 – 8) does not sense the 1000 Ohm end-of-line resistor. The yellow LED should be off.
2. Test the battery. The red “BAT” LED should be off. If it is on, check the battery wires then check the battery voltage. If below 11.8 VDC, the red “BAT” LED will be blinking as it is charging. If it measures below 10 VDC, then the battery may be bad.
3. Test the radio connection. Check the red radio LED. It should be blinking. The green carrier LED should be on. If not, call technical support at 877-993-1911.
4. Test the vertical status LEDs. A good installation ALWAYS has the green “A” LED on, while the green “DAL” LED is blinking quickly. The “SID” LED should be off. The Green “REG”, “ACK”, and “PAG” LEDs should remain off except when data is being sent. The “REG” LED will light during transmission. All yellow and red LEDs should be off. The red “BAT” LED will blink when the Mission RTU is charging its battery.
5. Test the alarm inputs. Check the horizontal input LEDs on the Mission main board. If any LEDs are blinking, the input does not sense a 1000-Ohm resistor. Check the wiring / connections of the resistors. Pump run inputs (1 – 3) do not blink. Test any alarm relay input by putting them into an alarm state. If this is not possible, short out the 1000-Ohm resistor at the relay/terminal connections. The corresponding input LED should turn on. If not, check wiring/connections. Ensure that all alarm inputs when CLOSED cause the corresponding Mission RTU input LED to turn on. It is recommended that you work with Mission Technical Support to confirm that alarms are being properly transmitted and received on your web portal.

6. Test the pump runtime inputs. Turn on pump 1. Mission RTU input 1 LED should illuminate. If not check the wiring and/or end-of-line resistors. Repeat step for pump 2 and 3 if used.
7. Test the high level alarm. It is recommended to perform this test. Open the wet well. Pull the high-level float up and put into alarm condition. Ensure that the Mission RTU input 4 LED turns on. If not, check the wiring (wet well module if used). Also check the high level float itself. Do not leave the installation until this alarm function is working. The alarm should be received and viewable by Mission Technical Support within a matter of seconds (typically less than 15 sec.) following the debounce period.

Wet Well Module: By performing the above pump run and high-level alarm tests you will have tested the wet well module. The green power LED should always be on. The yellow pump run LEDs come on when pumps are running. The red high level alarm LED should turn on when the high float is closed.

Verify that the customer is receiving the correct alarm notifications from the tests.

Chapter 7: Site Commissioning

Mission does not consider an installation complete until it has been fully tested by the end user.

It is imperative that ALL alarm points are tested and that alarm notifications are accurately received and acknowledged by the customer or end user. All alarm recipient phone numbers, pager numbers, fax numbers and e-mail addresses must also be tested. The customer or end user must ensure that the system is properly setup with Mission for e-mail or fax notification of unit trouble or outage alerts. Additionally, it is recommended that the customer or end user test all alarm points at least every 6 months to ensure all electrical components and alarm parameters are still functioning as desired and that alarms are being received and acknowledged by all recipients.

Completion of the unit setup form is important. It is how Mission configures and labels your unit inputs. Please provide us with accurate location coordinates (latitude and longitude). This is needed for plotting of the unit on your homepage map. A street address and zip code will also work. Provide your name and cell number so we can contact you with any questions. Email the setup form to setupforms@123mc.com. Mission cannot enable RTUs until setup forms are received. In emergencies we can take this information over the phone, however, we still require you to email it to us for documentation reasons.

Once the setup forms are received and entered, the RTU can be enabled for alarming and reporting.

It is recommended that you review the online manuals for a more specific and detailed operation of your RTU and web portal. This can be found on your menu selection in the DOWNLOAD folder under DOCUMENTS.

CONGRATULATIONS! Your unit is now ready for use. Visit www.123mc.com or www.123mc.mobi to view your web portal.

	SCADA Made Simple 1-877-993-1911	Username: <input type="text"/>
		Password: <input type="password"/>
		Forgot username? Forgot password?

Chapter 8: Troubleshooting

Below is a chart of possible problems and solutions:

Problem	Possible Solution
No LEDs come on with power.	Make sure transformer power (12-16 VAC) is getting to the RTU. Check battery voltage. (>11.5 VDC).
Vertical status yellow "TRB" LED stays on solid.	Make sure you have proper AC (12-16 VAC) power to the RTU.
Vertical status red "BAT" LED is the only LED on when the RTU is powered up.	Cycle RTU power.* If problem persists, call Mission.
Vertical status LED stops at "ACK" and red radio LED is on solid.	Check antenna connections and cycle RTU power. If problem persists, call Mission.
RTU cycles itself every 20-30 seconds.	Cycle RTU power and reset SIM card. If problem persists, call Mission.
Vertical status LED moves down the entire vertical stack, but you do not hear 3 beeps.	Check to see if the green carrier LED on the radio is on solid. If yes, the buzzer may be bad. Reseat the buzzer wires. If no green solid carrier LED on radio, let the RTU cycle itself as it may be a tower related issue.
No digital LED lights when in alarm.	Check wires and relay that you are wired in to for proper operation. Digital status LEDs are only active when unit is online.
Digital LED and/or vertical status "TRB" LED continuously blinks.	Make sure the 1,000 ohm resistor is installed at the relay or input. Check connections for tightness.

*Cycle power means removing the AC power and unplugging the battery to the Mission RTU for 15 seconds and then powering back up.

Contact Mission Technical Support at (877) 993-1911 if any problems exist with your RTU or web portal.

If you have a laptop computer with a serial port and cable it would be helpful to hook up to the main board before troubleshooting. (This is not necessary to still be able to troubleshoot effectively) but does help in in-depth monitoring of the board status through the use of hyper-terminal usually accessible through a program that is built in to your computer. Contact Mission Technical support for assistance.

Appendix A: Terminology

M110 - RTU with real-time alarms and hourly check-in of pump reports and analog values. Manual remote control is an available option with this unit.

M800 - RTU with real-time alarms, pump reports and analog values. Automated remote control is another available option with this unit.

NEMA 1 enclosure - Steel enclosure with battery inside.

NEMA 1 Flatpak enclosure - Steel enclosure that mounts inside the control panel. Battery is housed outside of the enclosure.

NEMA 4X enclosure - Water resistant, fiberglass outdoor enclosure with battery inside.

Power and Backup Power

The M110 and M800 RTUs operate safely on 12 VAC via the supplied transformer. They include a 5 amp hour battery with a charging circuit that powers the units for 30-35 hours during a power failure. There is an automatic alarm for external power failure and low battery condition. The included 120 to 12 VAC transformer mounts outside the RTU to protect the main board and radio from voltage spikes.

Digital Inputs

There are 8 dry contact inputs on M110 and M800 series that can be used for sensing alarms, pump status, as well as accumulating pump runtimes and pump starts. Both models can be equipped for an additional 8 digital inputs with the optional Digital Expansion Board to give you a total of 16 digital inputs.

Analog Inputs

There are 2 analog inputs on M110 and M800 series RTUs that can be used to report pressure, level, chlorine pH or any other dynamic readings by way of a 4-20mA or 0-5V transducer. The M800 can be expanded to 6 analog inputs. All analog inputs support 4 threshold alarm settings that can be remotely configured. Model 110 alarm thresholds are not supported by the expansion board but are supported on the two analog inputs on the main board.

Input Wiring Supervision

All digital input wires use end-of-line resistors for wiring supervision. Wiring supervision detects if input circuit wires become broken or disconnected and are thus unable to respond to alarm conditions. We'll tell you if a circuit wire breaks or becomes disconnected. N/O contact operation.

Key Reader Input

The included key reader allows on-site personnel to log a site visit and acknowledge and suspend alarms while service is performed at the station. Management can track the key entries for productivity and regulatory reporting purposes.

Pulse Inputs Options

2 pulse inputs can be used to report data such as flow, water meter or rainfall totals. If no rainfall data is monitored at the site, Mission's web site presents data from the closest National Weather Service reporting station. Pulse inputs are available with either the Pulse Option Board or the Analog Option Board.

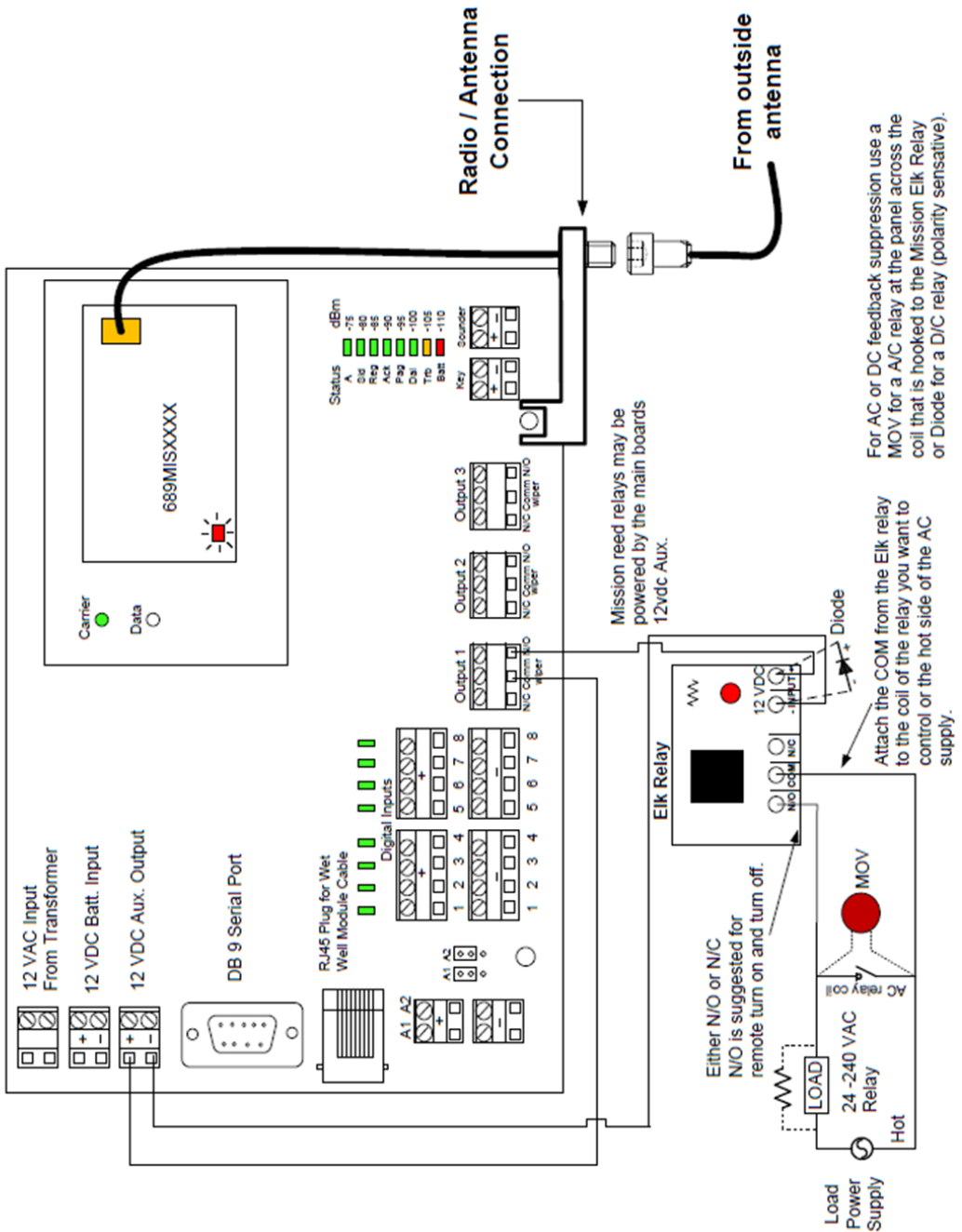
Digital Outputs

The M110 and M800 series support 3 relay outputs that can be remotely controlled. These can be used for any purpose including turning on pumps, wells or security lights. Multiple M800s can be linked so an event at one station causes a relay change at another. Mission's Tank and Well Control option and Intertie rely on this feature.

NOTE: It is highly recommended that the use of a 12 VDC coil interposing relay be used in conjunction with the Mission main board reed relays to prevent overload damage to the main board. Make sure the load side of the relay can handle the rated AC voltage of the load you are switching on or off.

Appendix B: Solid State Relay Diagram

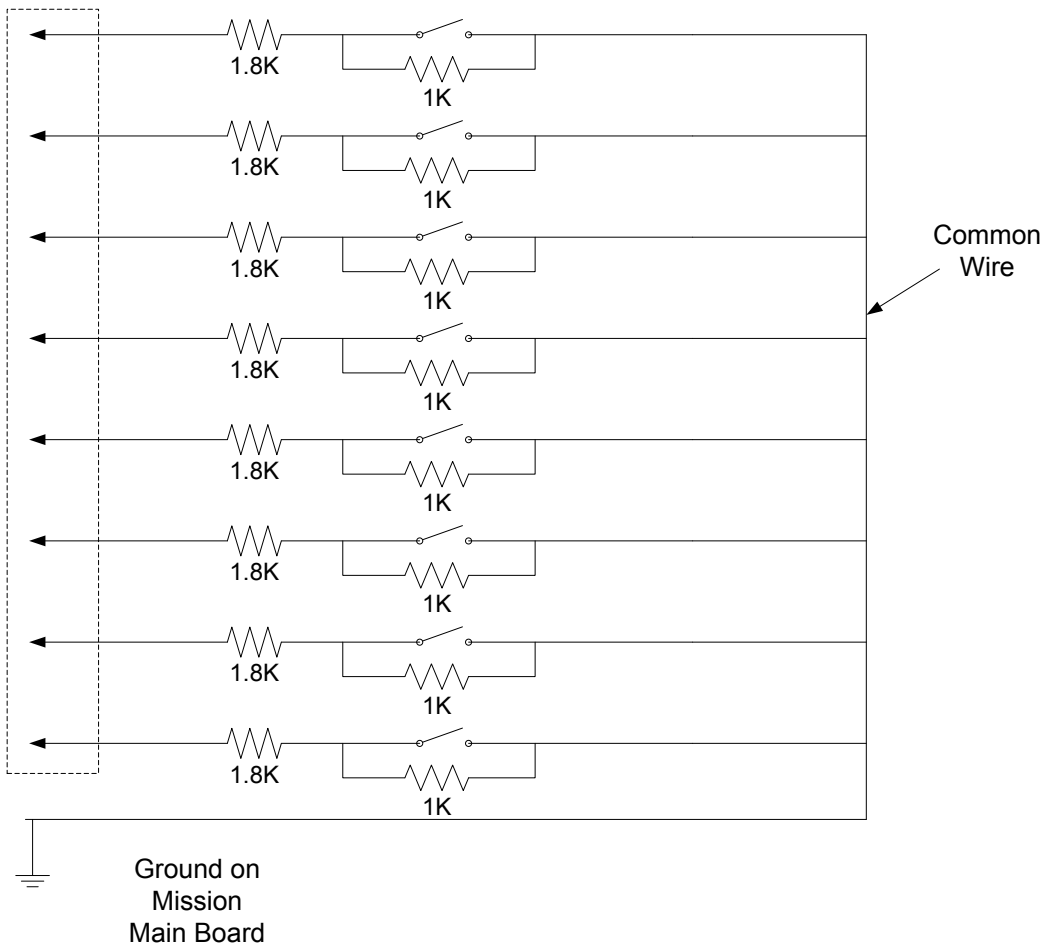
Mission Main Board



Appendix C: Wiring Output Relays With a Common Wire

To Mission Digital
Inputs – Upper
Terminals
(No connection to
lower terminals)

Output
Relay
Contacts





www.123mc.com
techsupport@123mc.com
sales@123mc.com
(877) 993-1911

Lit # M1M8IM-0814